(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 204 159 A3

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
25.02.2004 Bulletin 2004/09

(43) Date of publication A2:
08.05.2002 Bulletin 2002/19

(21) Application number: **01131028.1**

(22) Date of filing: **04.10.1995**

(51) Int Cl.[7]: **H01Q 1/27**, H01Q 1/36

(84) Designated Contracting States:
DE FR GB SE

(30) Priority: **04.10.1994 JP 24012294**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
95115640.5 / 0 706 231

(71) Applicant: **MITSUBISHI DENKI KABUSHIKI KAISHA**
Tokyo 100-8310 (JP)

(72) Inventors:
- **Imanishi, Yasuhito, Mitsubishi Denki K.K.**
  Amagasaki-shi, Hyogo 661 (JP)
- **Komori, Eriko, Mitsubishi Denki K.K.**
  Amagasaki-shi, Hyogo 661 (JP)

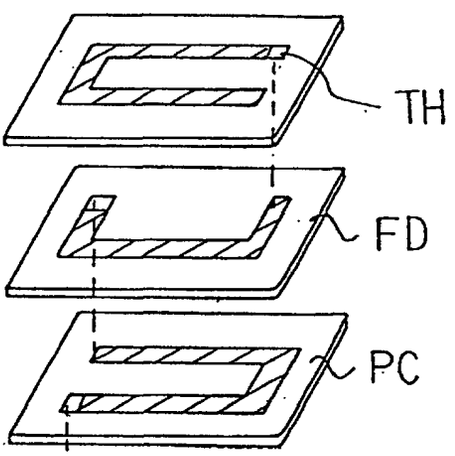
(74) Representative: **HOFFMANN - EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) **Antenna equipment**

(57) An antenna equipment for use with radio waves of a predetermined wavelength comprises a metal case (2; 112) for containing a radio circuit (3); a plastic case (1) surrounding and electrically insulating said metal case; and an antenna element for transmitting/receiving radio waves from/to the radio circuit,

wherein said antenna element comprises a multilayered inductance element (7; 8; 17; 117) mounted externally of said metal case and formed of a plurality of sheets (FD) of insulating material stacked upon one another to form a stack, with conductor segments (PC) of a spirally shaped inductance element being carried separately on the sheets and being electrically connected to each other through via-holes (TH) extending through said sheets to form the multilayered inductance element in the form of a continuous conductor formed of the conductor segments and extending spirally within the stack of the sheets; and case or sleeve means (2; 11; 14; 15a, 15b; 112, 18) electromagnetically shielding said radio circuit (3) or parts (10) electrically connected to said radio circuit; wherein said multilayered inductance element (7; 17; 117) extends to an equivalent length equal to approximately a half of a wavelength, said multilayered inductance element acting with a matching circuit (9) and said case or sleeve means (2; 11; 14; 15a, 15b; 112, 18).

Fig.2A



EP 1 204 159 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 13 1028

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	PATENT ABSTRACTS OF JAPAN vol. 18, no. 311 (E-1561), 14 June 1994 (1994-06-14) & JP 06 069057 A (TAIYO YUDEN), 11 March 1994 (1994-03-11) * abstract * ---	1	H01Q1/27 H01Q1/36
A	PATENT ABSTRACTS OF JAPAN vol. 8, no. 99 (E-243) [1536], 10 May 1984 (1984-05-10) & JP 59 017705 A (TDK K.K.), 30 January 1984 (1984-01-30) * abstract * ---	1	
A	US 5 250 923 A (TOMOAKI USHIRO ET AL) 5 October 1993 (1993-10-05) * abstract; figure 2 * ---	1	
A	EP 0 590 534 A (NTT MOBILE COMMUNICATIONS NETWORK) 6 April 1994 (1994-04-06) * abstract; figures 14,15 * * column 11, line 56 - column 12, line 2 * ---	1-4	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01Q H01F
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 379 (E-1247), 13 August 1992 (1992-08-13) & JP 04 120902 A (MITSUBISHI ELECTRIC CORP;OTHERS: 01), 21 April 1992 (1992-04-21) * abstract * ---	1-4	
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 283 (E-1373), 31 May 1993 (1993-05-31) & JP 05 014040 A (NIPPON TELEGR & TELEPH CORP), 22 January 1993 (1993-01-22) * abstract * ---	1,19,20	
	-/--		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	29 December 2003	Marot-Lassauzaie, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 13 1028

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 367 609 A (MOTOROLA INC) 9 May 1990 (1990-05-09) * abstract * ---	1,10,14	
A	US 4 772 895 A (GARAY OSCAR M ET AL) 20 September 1988 (1988-09-20) * abstract * -----	10-13	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	29 December 2003	Marot-Lassauzaie, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 13 1028

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-12-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 06069057 A	11-03-1994	NONE	
JP 59017705 A	30-01-1984	JP 1600671 C	31-01-1991
		JP 2006445 B	09-02-1990
US 5250923 A	05-10-1993	JP 3114323 B2	04-12-2000
		JP 5190363 A	30-07-1993
EP 0590534 A	06-04-1994	JP 2809365 B2	08-10-1998
		JP 6112722 A	22-04-1994
		DE 69320435 D1	24-09-1998
		DE 69320435 T2	18-03-1999
		EP 0590534 A1	06-04-1994
		US 5412392 A	02-05-1995
JP 04120902 A	21-04-1992	JP 2581834 B2	12-02-1997
JP 05014040 A	22-01-1993	DE 69215283 D1	02-01-1997
		DE 69215283 T2	20-03-1997
		EP 0522806 A2	13-01-1993
		US 5374937 A	20-12-1994
EP 0367609 A	09-05-1990	US 4868576 A	19-09-1989
		AT 125646 T	15-08-1995
		AU 610439 B2	16-05-1991
		AU 4339389 A	28-05-1990
		BR 8907142 A	13-02-1991
		CA 1322785 C	05-10-1993
		DE 68923598 D1	31-08-1995
		DE 68923598 T2	28-03-1996
		DK 149590 A	19-06-1990
		EP 0367609 A2	09-05-1990
		ES 2075060 T3	01-10-1995
		HU 53988 A2	28-12-1990
		IE 69268 B1	21-08-1996
		JP 2044823 C	09-04-1996
		JP 2271701 A	06-11-1990
		JP 7070896 B	31-07-1995
		KR 9301074 B1	15-02-1993
		MX 166681 B	27-01-1993
		NO 902873 A	28-06-1990
		SU 1838850 A3	30-08-1993
		WO 9005390 A1	17-05-1990
US 4772895 A	20-09-1988	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82